# Investigation of the relationship between rainfall and long-term settlements of earthfill dams based on geodetic measurements: the case of Pournari I dam (Greece)

Niloufar Zanganehazadabadi[1], Stella Pytharouli[1], Panagiotis Michalis[2]

[1] Department of Civil and Environmental Engineering, University of Strathclyde, James Weir Building, 75 Montrose Street, Glasgow G1 1XJ, UK, (stella.pytharouli@strath.ac.uk)
[2] Faculty of Civil Engineering, University of Zagreb, Kaciceva 26, Zagreb, Croatia (pmichalis@grad.hr)

**Abstract**

Ageing earthfill dams can become vulnerable to weather phenomena such as rainfall and flooding, with severe consequences, both economic and life threatening, to the communities living downstream. A better understanding of their long-term behaviour and the factors affecting it, is crucial towards this direction. While there are studies in the international literature that focus on the effect of rainfall on the stability of slopes in general, there are very few, if any, on the effect of rainfall specifically on earthfill dams.

In this study, we use a unique data set consisting of the crest settlements of an earthfill, central clay core dam, the Pournari I dam in Greece, the daily reservoir level fluctuations and rainfall height values at the dam site over a period of almost 35 years. The dam is 107 m high and its construction was completed in 1981. In previous studies the settlements of this dam, including rates, were found to be within limits and compliant with empirical relationships derived for dams of this type.

Our work focuses on removing the effect of primary consolidation and creep from the settlements and attempting to study the relationship between the residuals and rainfall. Our results show that consolidation was completed within 4 years since the end of construction (by 1985) and the residuals of all points on the crest appear to follow the same evolution pattern. While no direct relationship could be established between the actual settlement observations and the rainfall, residuals seem to have maximum correlation with the cumulative rainfall height over a period of two months before the settlement measurement epoch. Our findings most likely represent a threshold value of rainfall above which the dam seems to be responding rather than a time duration over which rainfall plays an important role to the settlements of the dam.

**Keywords:** *earthfill dam, rainfall, crest settlements, long-term geodetic monitoring*

**Presentation preference:** oral